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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/709,733	05/25/2004	Emily E. Gallagher	BUR920030178USI	3732
29154	7590	11/28/2005	EXAMINER	
FREDERICK W. GIBB, III GIBB INTELLECTUAL PROPERTY LAW FIRM, LLC 2568-A RIVA ROAD SUITE 304 ANNAPOLIS, MD 21401			ROSASCO, STEPHEN D	
			ART UNIT	PAPER NUMBER
			1756	
DATE MAILED: 11/28/2005				

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/709,733

Applicant(s)

GALLAGHER ET AL.

Examiner

Stephen Rosasco

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 7/22/04.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-48 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-48 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 May 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 5/25/04, 7/22/04
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

Detailed Action

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Lin (2005/0250019) or Udagawa et al. (2004/0126673).

Lin teaches a mask device comprising: a transparent substrate;
and a patterned single layer of reflection mask with a rough surface region and a smooth surface region thereon and therein on said transparent substrate.

Lin also teaches

Page 3 section [0035] In FIG. 2C, when the incident exposing radiation 20 such as EUV (extreme ultraviolet) radiation with a wavelength in the range of 10 to 14 nanometers (nm) to carry out projection imaging, and with an incident grazing angle is illuminated to the rough surface region 14a and the smooth surface region 14b of the patterned single layer of reflection mask 12, the rough surface region 14a will absorb or scatter the incident exposing radiation 20, and the smooth surface region 14b will reflect the incident exposing radiation 20, respectively. When the rough surface region 14a absorbed or scattered the incident exposing radiation, the transferred pattern on the wafer will present a dark area, such that the rough surface region 14a could be set as zero "0", which expresses that is no feature on the wafer.

Udagawa et al. teach (see claims) a reticle for use in microlithography of a device pattern to an exposure-sensitive substrate using an energy beam, the reticle comprising: a reticle substrate having a surface; a device pattern, defined on the reticle substrate, to be transfer-exposed onto the exposure-sensitive substrate; and a reticle-identification code defined on the surface of the reticle substrate, the reticle-identification code comprising multiple high-scattering regions each exhibiting a relatively high degree of reflection-scattering of irradiated probe light, the high-scattering regions being separated from one another by respective low-scattering regions exhibiting a low degree of reflection-scattering of the irradiated probe light, relative to the high-scattering regions.

And wherein the low-scattering regions present respective surfaces that are sufficiently smooth to avoid significant reflection-scattering, from the surfaces, of probe light incident on the surfaces; and each high-scattering region comprises multiple scattering features that reflection-scatter incident probe light.

And wherein the features in each high-scattering region comprise a checkerboard pattern of projections and recesses that collectively define multiple edges.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin (2005/0250019) or Udagawa et al. (2004/0126673) in view of Cardinale (6,368,942).

The claimed invention is directed to a reflection or EUV mask and methods of making. The applicant discusses the limitations of the prior art in that conventional optical masks include transmissive and absorptive regions. However, because the masks used in the EUVL system are reflective, the EUV radiation must be exposed to the mask surface at an angle such that the pattern will reflect onto the surface of the wafer. Specifically, light incident on the exposed reflective surface is reflected. Light incident on the patterned absorber film is absorbed which heats the mask.

Five degrees is the optimal angle of exposure. The absorber stack height is finite and creates a shadow under the angle of illumination which blurs the edge of the raised absorber when imaged. This reduction in contrast is a function of the angle of the incident exposure light and both the absorber and buffer layer thickness. Reduced contrast at the pattern edges is a significant issue.

The claimed invention eliminates both buffer and absorber layers for a light scattering stack.

Lin and Udagawa et al. are included here as discussed above.

The teachings of Lin and Udagawa et al. differ from those of the applicant in that the applicant teaches the use of anodic bonding (claim 28) to bond the crystalline silicon layer to the substrate and the use of differently shaped scattering regions.

Cardinale teach a method for fabricating mask blanks for use in extreme ultraviolet lithography, comprising;

- providing a wafer of an ultra-low expansion material;

- providing a wafer of crystalline silicon;

- bonding the wafer of crystalline silicon to the wafer of ultra-low expansion material;

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reducing the thickness of the exposed surface of the wafer of crystalline silicon to a thickness of between about 5 μm and 10 μm ;

polishing the exposed surface of the reduced thickness crystalline silicon wafer thereby forming a mask blank of ultra-low expansion material with a crystalline silicon surface; and

forming a silicon oxide film on the crystalline silicon exposed surface for reducing thermal stress.

And wherein the step of bonding is carried out by a technique selected from the group of bonding techniques consisting of anodic bonding, thermal compression bonding, and room temperature bonding.

Cardinale also teaches bonding a wafer of crystalline silicon to a surface of a wafer of an ULE material by a technique selected from the group of techniques consisting of anodic bonding, thermal compression bonding and room temperature bonding;

thinning an exposed surface of the wafer of crystalline silicon to a thickness of between about 5 μm to about 10 μm ; and

forming a silicon oxide film on the crystalline silicon exposed surface for reducing thermal stress.

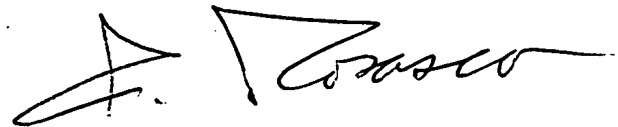
It would have been obvious to one having ordinary skill in the art to take the teachings of Lin and Udagawa et al. and combine them with the teachings of Cardinale in order to make the claimed invention because using different shaped surfaces to scatter light in general is well known and the applicant is using processes that would be considered beneficial for EUV which requires more uniform and stable surfaces.

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Conclusion

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Stephen Rosasco whose telephone number is (571) 272-1389. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. The Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'S. Rosasco', with a stylized, sweeping flourish at the end.

S. Rosasco
Primary Examiner
Art Unit 1756

S. Rosasco
11/17/05